

Increasing Efficiency of Routine Robot Space Operations through Adjustable Autonomy and Learning from Human Instructions

Completed Technology Project (2016 - 2020)



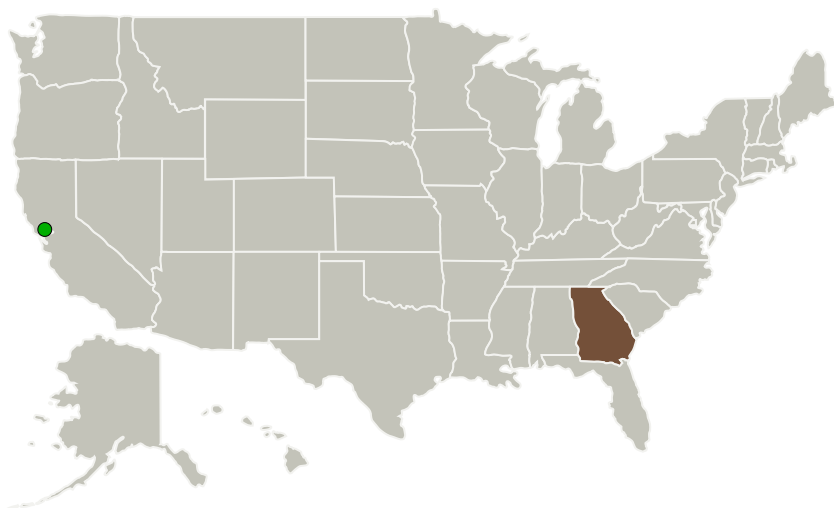
Project Introduction

This research aims to address the execution of repetitive, routine and potentially hazardous tasks by robots operating in crewed low Earth orbit, lunar and Mars-based deployments. Current practices in deploying robotic space systems are limited to manual teleoperation of robots by crew in co-located settings, and the use of carefully hand-crafted structured control sequences from ground control. Both approaches are costly in terms of crew time and effort, and are not scalable for long-term, co-robot deployments. The objective of this work is to improve operational efficiency of robotic systems by lowering deployment time, increasing robustness of routine operations, and increasing support for human astronauts by enabling a robot to leverage the input it obtains from human operators to incrementally increase operational autonomy. Our approach focuses on techniques for identifying what information is needed to improve task performance, decision mechanisms for selecting between crew and ground control interactions, development of interface methodologies for task recovery interactions, and algorithmic methods for improving autonomy based on the acquired instructions.

Anticipated Benefits

The objective of this work is to improve operational efficiency of robotic systems by lowering deployment time, increasing robustness of routine operations, and increasing support for human astronauts by enabling a robot to leverage the input it obtains from human operators to incrementally increase operational autonomy.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Website:	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Georgia Institute of Technology-Main Campus(GA Tech)	Lead Organization	Academia	Atlanta, Georgia
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations

Georgia

Project Website:

<https://www.nasa.gov/strg#.VQb6T0jJzyE>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Georgia Institute of Technology-Main Campus (GA Tech)

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

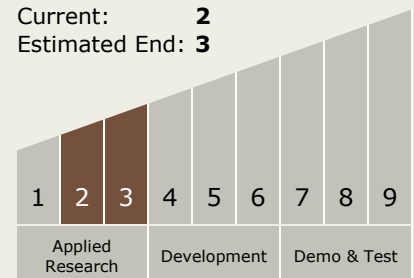
Sonia H Chernova

Technology Maturity (TRL)

Start: 2

Current: 2

Estimated End: 3



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - └ TX11.2 Modeling
 - └ TX11.2.3 Human-System Performance Modeling

Target Destinations

Earth, The Moon, Mars